International Journal of

MACHINE TOOLS & MANUFACTURE

Design, Research and Application

(formerly Machine Tool Design and Research)

VOLUME 32, 1992

VOLUME CONTENTS AND AUTHOR INDEX

PERGAMON PRESS
OXFORD • NEW YORK • SEOUL • TOKYO

International Journal of MACHINE TOOLS & MANUFACTURE Design, Research and Application

Editors-in-Chief: R. DAVIES and T. A. DEAN

Department of Manufacturing and Mechanical Engineering, The University of Birmingham, P.O. Box 363, Birmingham B15 2TT, U.K.

Regional Editors

Prof. P. L. B. OXLEY, School of Mechanical & Industrial Engineering, The University of New South Wales, P.O. Box 1, Kensington, New South Wales, Australia 2033.

Prof. H. A. AL-QURESHI, Instituto Tecnólogico de Aeronautica, Departamento de Tecnologia, IEM, Campo Montenegro, CTA, 12.225-São José dos Campos-SP, Brazil.

Prof. ZIGONG ZHANG, Mechanical Engineering, Xi'an Jiaotong University, Shaanxi Province, P.R. of China.

Prof. W. KONIG, Lehrstuhl fur Technologie der Fertigungsverfahren Werkzeugmaschinenlabor, RWTH Aachen, Steinbachstr. Block 53/54, D-5100 Aachen, Melaten Nord, F.R.G.

Prof. Dr ING KURT LANGE, Institut fur Umformtechnik, Universitat Stuttgart, 7000 Stuttgart 1, Holzhartenstr. 17, F.R.G.

Prof. G. F. MICHELETTI, Strada del Mylius 16, Moncalieri, Italy.

Prof. K. KONDO, Department of Mechanical Engineering, Faculty of Engineering, Nagoya University, Furo-Cho, Chikusa-ku, Nagoya, 464 Japan.

Prof. W. A. KNIGHT, Industrial & Mfg Eng Dept, the University of Rhode Island, Kingston, RI 02881, U.S.A.

Reviewing Committee

D. K. ASPINWALL, Birmingham, U.K.
T. ALTAN, Columbus, Ohio, U.S.A.
B. AVITZUR, Bethlehem, Penn., U.S.A.
R. BELL, Loughborough, U.K.
L. BLUNT, Birmingham, U.K.
M. F. DEVRIES, Madison, Wisc., U.S.A.
L. FARMER, Kensington, Australia.
E. VON FINCKENSTEIN, Aachen, F.R.G.
D. FRENCH, British Columbia, Canada.
R. S. HAHN, Auburn, Mass., U.S.A.
I. HAM, State College, Penn., U.S.A.
P. HARTLEY, Birmingham, U.K.
W. HEGINBOTHAM, Nottingham, U.K.
C. HOOKE, Birmingham, U.K.
B. JONES, Birmingham, U.K.
M. KIUCHI, Tokyo, Japan.
C. H. KU, Xi'an, China.
N. LEIGHTON, Wolverhampton, U.K.
M. LOFTUS, Birmingham, U.K.
J. A. MCGEOUGH, Edinburgh, U.K.
J. MILBERG, Munich, F.R.G.
C. F. NOBLE, Manchester, U.K.
K. OSAKADA, Osaka, Japan.
D. T. PHAM, Cardiff, U.K.
I. PILLINGER, Birmingham, U.K.
W. B. ROWE, Liverpool, U.K.
G. SPUR, Berlin, F.R.G.
P. SULLIVAN, Birmingham, U.K.
G. SWEENEY, Macclesfield, U.K.
I. N. TANSEL, Miami, Flor., U.S.A.
R. H. THORNLEY, Birmingham, U.K.
E. M. TRENT, Malvern, U.K.
G. TRMAL, Bristol, U.K.
D. WALTON, Birmingham, U.K.
H. J. WARNECKE, Stuttgart, F.R.G.
A. R. WATSON, Campbell, Australia.
J. WEBSTER, Storrs, Conn., U.S.A.
M. WECK, Aachen, F.R.G.
M. L. WISE, Birmingham, U.K.
I. YELLOWLEY, British Columbia, Canada.
B. S. YILBAS, Kayseri, Turkey.

Publishing, Subscription and Advertising Offices

Pergamon Press Ltd, Headington Hill Hall, Oxford, OX3 0BW, U.K. Tel. (0865) 794141; Fax (0865) 60285.
Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.

Published six times/annum in February, April, June, August, October and December

Subscription Rates

Annual institutional subscription rate (1993): £295.00 (US$561.00). Sterling prices are definitive. US dollar prices are quoted for convenience only, and are subject to exchange rate fluctuation. Prices include postage and insurance and are subject to change without notice.

Subscription enquiries from customers in North America should be sent to: Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A., and for the remainder of the world to: Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, U.K.

Second class postage paid at RAHWAY NJ. Postmaster send address corrections to *International Journal of Machine Tools & Manufacture*, Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.

Copyright © 1992 Pergamon Press Ltd

VOLUME CONTENTS

Number 1/2

PROCEEDINGS OF THE 5th INTERNATIONAL CONFERENCE ON METROLOGY AND PROPERTIES OF ENGINEERING SURFACES

K. J. Stout	1	Foreword and Acknowledgements
OPTICAL TECHNIQUES		
J. C. Wyant and K. Creath	5	Advances in interferometric optical profiling
D. Mansfield	11	Surface characterisation via optical diffraction
D. M. G. Stevens	19	The application of optical techniques in aspheric surface assessment
J. Jungles	27	High speed measurement of engineering surfaces
A. B. Kiely, T. R. Lettieri and T. V. Vorburger	33	A model of an optical roughness-measuring instrument
ASSESSMENT OF MANUFACTURING PROCESSES		
R. F. Babus'Haq, R. Evans, P. W. O'Callaghan and S. D. Probert	39	Deformations of engineering surfaces under static loads
P. H. Osanna and P. Totewa	45	Workpiece accuracy—the critical path to economical production
G. R. Dickson and R. McIlhagger	51	Assessing the surface finish of polymer composite components
J. R. Clark and M. B. Grant	57	The effect of surface finish on component performance
SIMULATION TECHNIQUES		
P. J. Scott	69	The mathematics of motif combination and their use for functional simulation
C. C. Kweh, M. J. Patching, H. P. Evans and R. W. Snidle	75	Use of profile data in simulation of lubrication of real surfaces
Y. Z. Hu and K. Tonder	83	Simulation of 3-D random rough surface by 2-D digital filter and Fourier analysis
P. H. Osanna, N. M. Durakbasa, M. Cakmakci and R. Oberländer	91	Cylindricity—a well known problem and new solutions
2-D CHARACTERIZATION		
T. A. Starbuck	101	Software techniques for removing unwanted features on components when performing automatic form measurement
H.-J. Böhm	109	Parameters for evaluating the wearing behaviour of surfaces
J. I. McCool	115	Non-Gaussian effects in microcontact
K. Sasajima and T. Tsukada	125	Measurement of fractal dimension from surface asperity profile
C. Gardin, H. Lanchon-Ducauquis, J. Saint Jean Paulin, D. Billerey, N. Debbabi and M. Platek	129	Mathematical approaches of thermal and thermoelastic contact
K. Yanagi, Y. Tsukada and Y. Mutoh	137	A geometrical assessment of machined ceramic surface for estimating fatigue strength
F. L. Litvin, Y. Zhang and C. Kuan	141	Computerized inspection of real surfaces and minimization of their deviations

R. F. O'Connor and T. A. Spedding — 147 The use of a complete surface profile description to investigate the cause and effect of surface features

3-D CHARACTERIZATION

P. Sullivan, V. Poroshin and C. Hooke — 157 Application of a three-dimensional surface analysis system to the prediction of asperity interaction in metallic contacts

B. D. Boudreau and J. Raja — 171 Analysis of lay characteristics of three-dimensional surface maps

N. L. Luo and P. J. Sullivan — 179 Formal theory of measurement in surface topography representation

D. K. Aspinwall, M. L. H. Wise, K. J. Stout, T. H. A. Goh, F. L. Zhao and M. F. El-Menshawy — 183 Electrical discharge texturing

I. Walker and A. F. Wallis — 195 Applications of 3-D solid modelling to coordinate measuring inspection

J. Boulanger — 203 The "motifs" method: an interesting complement to ISO parameters for some functional problems

D. Wehbi, C. Roques-Carmes and C. Tricot — 211 The perturbation dimension for describing rough surfaces

INSTRUMENTS

I. Sherrington and E. H. Smith — 219 Performance assessment of stylus based areal roughness measurement systems

N. Rau, R. Fingerle and G. Hübner — 227 Judgement of surface structures and changes in fuel-injection tubing by a pneumatic measuring method

J. D. Garratt and D. J. Nettleton — 233 A stylus instrument for roughness and profile measurement of ultra-fine surfaces

D. G. Chetwynd, X. Liu and S. T. Smith — 239 Signal fidelity and tracking force in stylus profilometry

D. J. W. Dawson — 247 Cylindricity and its measurement

F. G. Parsons and A. N. Tabenkin — 255 The theory and development of user-friendly software for the measurement of surface roughness and geometrical parameters

T. G. Mathia, H. Zahouani and A. Midol — 263 Topography, wear and sliding functions of skis

Announcements — 267

Number 3

A. K. Srivastava, K. M. Yuen and M. A. Elbestawi — 269 Surface finish in robotic disk grinding

Y. Gao and B. Jones — 281 An integrated sensor system for size and roundness control in plunge grinding

Y. Gao, B. Jones and J. Webster — 291 An integrated size and roundness adaptive control system for the plunge grinding process

K. K. Padmanabhan — 305 Prediction of damping in machined joints

S. M. Lee, W. Shin and R. Shivpuri — 315 Investigation of two square-to-round multipass rolling sequences by the slab-finite element method

Y. Altintas and P. K. Chan — 329 In-process detection and suppression of chatter in milling

D. T. Pham and E. Tacgin — 349 Grippex: a hybrid expert system for selecting robot gripper types

Shiuh-Jer Huang and Shinn-Horng Chen — 361 Optimal control and analysis of hydraulic machine tool servo system

E. Eruç and R. Shivpuri — 379 A summary of ring rolling technology—I. Recent trends in machines, processes and production lines

E. Eruç and R. Shivpuri 399 A summary of ring rolling technology—II. Recent trends in process modeling, simulation, planning, and control

Chen Jin-de, Wang Yu-wei, Yu De-hong and Zhang Zi-gong 415 Brittle precision cropping of metal materials

Chen Jin-de, Yu De-hong, Wang Yu-wei and Zhang Zi-gong 425 Plastic precision cropping of metal materials

R. E. Ilhan, G. Sathyanarayanan, R. H. Storer and T. W. Liao 435 Off-line multiresponse optimization of electrochemical surface grinding by a multi-objective programming method

I. Yellowley and D. Adey 453 A new approach to the real time optimization of turning operations

Erratum 467

Erratum 473

Announcements 475

Number 4

J. Yan, M. A. El-Baradie and M. S. J. Hashmi 477 The development of a robotic compliance control system

W. König, K. Kutzner and U. Schehl 487 Tool monitoring of small drills with acoustic emission

Y. Yao and X. D. Fang 495 Modelling of multivariate time series for tool wear estimation in finish-turning

K. Jemielniak 509 Modelling of dynamic cutting coefficients in three-dimensional cutting

D. A. Stephenson and J. S. Agapiou 521 Calculation of main cutting edge forces and torque for drills with arbitrary point geometries

E. I. Rivin and Hongling Kang 539 Enhancement of dynamic stability of cantilever tooling structures

B. Rajmohan and V. Radhakrishnan 563 A study on the thermal aspects of chips in grinding

A. K. Chattopadhyay, L. Chollet and H. E. Hintermann 571 Improved monolayer CBN wheel for load free grinding

H. Hocheng and H. Y. Puw 583 On drilling characteristics of fiber-reinforced thermoset and thermoplastics

S. M. Darwish, A. Niazi and A. Ghaneya 593 Phase stability of Duralumin machined with bonded and brazed carbide tools

Chinghua Hung and S. Kobayashi 601 Finite element deformation analysis of metal matrix composites

K. Kim and S. D. Huang 619 Implementation of pole placement adaptive controller for force control of non-minimum phase end milling operations

Number 5

S. C. Lin and M. R. Hu 629 Low vibration control system in turning

Y. S. Tarng and B. Y. Lee 641 Use of model-based cutting simulation system for tool breakage monitoring in milling

A. Gangadhar, M. S. Shunmugam and P. K. Philip 651 Pulse train studies in EDM with controlled pulse relaxation

Jia Yazhou and Zheng Di 659 A note on the rating of gears based on power and torque characteristics of machine tools

R. Shivpuri and W. Shin 671 A methodology for roll pass optimization for multi-pass shape rolling

R. Lakshmipathy and R. Sagar 685 Effect of die surface topography on die-work interfacial friction in open die forging

Chen Zhou and R. A. Wysk 695 An integrated system for selecting optimum cutting speeds and tool replacement times

I. S. Jawahir, N. Qureshi and J. A. Arsecularatne 709 On the interrelationships of some machinability parameters in finish turning with cermet chip forming tool inserts

R. Kovacevic 725 Monitoring the depth of abrasive waterjet penetration

T. Radhakrishnan and R. Rajkamal 737 An approach to design a gripper for part fetching/registration in flexible, high-speed, automated PC board assembly

C. B. Goh 747 Axial pipe milling machine

D. C. Furze, B. Griffiths, S. Walton and A. Franks 757 A short duration strip drawing rig

Number 6

Huang Ren, Shi Xiurong, Ding Ruilian, Zhong Binglin, Mao Yuliang and J. A. Brandon 767 A study of on-line identification for grinding burn

R. X. Du, M. A. Elbestawi and S. Li 781 Tool condition monitoring in turning using fuzzy set theory

A. K. Srivastava, D. B. Rogers and M. A. Elbestawi 797 Workpiece burn and surface finish during controlled force robotic disk grinding

I. N. Tansel, C. Erkal and T. Keramidas 811 The chaotic characteristics of three dimensional cutting

I. N. Tansel 829 Modelling 3-D cutting dynamics with neural networks

G. S. Li, W. S. Lau and Y. Z. Zhang 855 In-process drill wear and breakage monitoring for a machining centre based on cutting force parameters

F. L. Litvin, Chihping Kuan, Yi Zhang and J. Masseth 869 Computerized inspection of hypoid pinion face-milled tooth surfaces

A. Y. C. Nee and A. S. Kumar 885 A rule-based system for angular tolerance charting

Title Section, Volume Contents and Author Index I